

# CAAP Annual Report

Date of Report: *Jul 15, 2016*

Contract Number: *DTPH56-14-H-CAP01*

Prepared for: *DOT*

Project Title: *Patch and Full-Encirclement Repairs for Through-Wall Defects*

Prepared by: *The University of Tulsa*

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For quarterly period ending: *July 10, 2016*

## **Business and Activity Section**

### **(a) Generated Commitments**

As was the case for the related project, one of the project participants, Pipewrap, was acquired by a third party after they committed to this project. As a result, they have been unable to schedule a time to install repairs on their small-scale specimens. At this point, we are planning on dropping them from the study. We are discussing the possibility of them sending us repair materials that we will install for the large scale test.

<b>Supplies Purchased</b>	<b>Cost</b>
Piping and fittings	\$97.80
Pressure Transducer	\$277.00

### **(b) Status Update of Past Quarter Activities**

During this past quarter, we have accomplished the following research activities

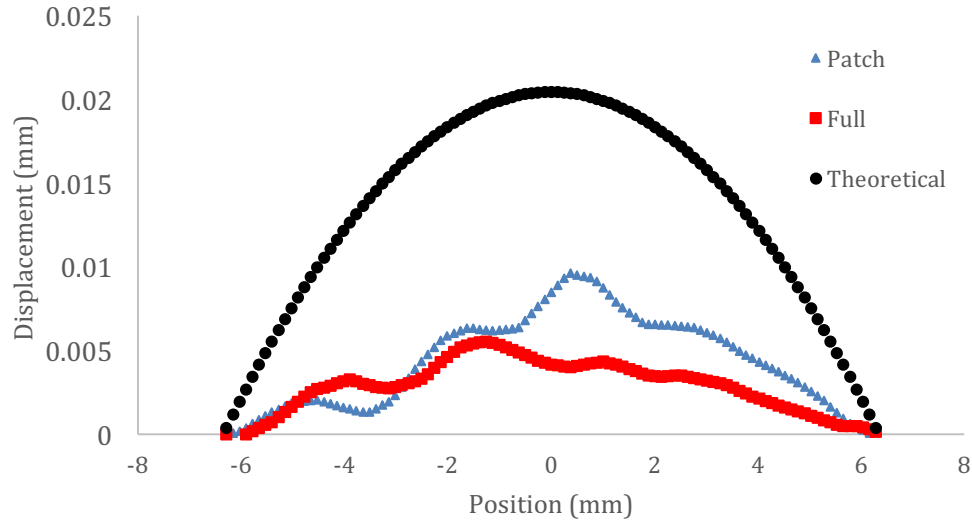
1. Continued fatigue testing of small scale samples.
2. Continued strain gage study of repairs.
3. Continued DIC studies of repairs.
4. Presented conference paper at SEM
5. Scheduled repairs for large scale test.

Student in charge of following research: Stephen Theisen (M.S. – expected summer 2016)

### **Small Scale Test Program**

Small scale specimen testing has continued. We have one more pressure vessel to test and we will have completed the testing. The trend of no-statistical difference between the full encirclement and the patch has continued. We have completed a DIC study of the repairs and have found that the patch and the full-encirclement repairs have similar displacement profiles above the hole location as is shown in Figure 1. From the results in this figure we can see that the patch and the full encirclement repairs have similar out-of-plane deflections. Since the interfacial fracture energy is governed by this out-of-plane deflection, the similar profiles reinforce the conclusion that the behavior of the patch and the full-

encirclement repairs will be similar. The theoretical prediction for these repairs grossly over-estimates the deflection and leads to significant conservatism in the design of these repairs.



**Figure 1: Comparison of full encirclement, patch and theoretical predictions for the repair displacement above the flaw.**

### **Large Scale Specimen**

The large scale specimen is complete and we have schedule installs for all participating companies. We expect that all three repairs will be installed by the end of July. Testing will begin shortly after the installs are complete.

### **(c) Description of any Problems/Challenges**

As in last quarter, we are working to make sure that the two patch related programs are moving together and are attempting to limit any slow-downs with respect to testing conflicts for these two test programs. There were no other significant issues.

### **(d) Planned Activities for the Next Quarter –**

Planned activities for the next quarter include the following

1. Complete fatigue testing of small scale repairs.
2. Complete repair installs for large-scale test vessel.
3. Begin large scale testing.